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ABSTRACT

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RESPONSE STYLES AND 16 PF HIGHER ORDER FACTORS

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Response Styles and 16 PF Higher Order Factors

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Abstract

This study's aim was to explore the relationship of acquiescence, social desirability (SD), and defensiveness response styles with first, second, and any higher order factors on the 16 PF. All the various kinds of response bias indexes were appreciably correlated with the first order factor scales. Each kind of response style measure predominantly loaded a different second order factor--four such factors were extracted, three of them corresponding to well established 16 PF second order factors. SD scales defined a novel factor somewhat resembling an anxiety factor, and acquiescence and defensiveness measures loaded but did not define independence and anxiety factors, respectively. None of the various kinds of response style indexes consistently loaded an extroversion factor. And none loaded the single third order factor obtained. This factor was not similar to previously reported 16 PF third order factors and its nature was unclear.

Response Styles and 16 PF Higher Order Factors[1]

Despite the extensive research into the role of response styles on personality inventories, little is known about the involvement of these variables with the questionnaires' higher order factors. Controversy exists about both the order at which response styles may emerge as well as their relationship with second and third order factors that ostensibly reflect content. On the order issue, Block (1965) suggested that acquiescence may appear either as a first order factor loaded by all the items on a questionnaire or as a second order factor loaded by a large number of first order factors. Borgatta (1968), in contrast, contended that social desirability (SD) response style could be expected to appear as a first order factor, but in cases where factor scales rather than actual factors are involved, imperfections in the test construction procedures might prevent the emergence of such a factor at this level. Vernon (1964), however, asserted that this response bias is spread out among the various first order factors uncovered by Guilford (1959) and Cattell (1957), rather than being confined to one or two factors. As a result, the response style might arise as a higher order factor. Vernon viewed this diffusion of stylistic variance among the first order factors as an inevitable consequence of the factor analytic process. Concerning the involvement of response biases with second and third order factors, Vernon (1964) argued that the second order extroversion and anxiety or neuroticism factors identified by Cattell (1957) and Eysenck (Eysenck & Eysenck, 1969) are produced, at least in part, by acquiescence and SD response styles, respectively. Borgatta (1968), however, contended that such factors tap content but may, in turn, generate a third order factor linked with SD response style.

Much of the research on these issues has involved the Sixteen Personality Factor Questionnaire (16 PF; Cattell, Eber, & Tatsuoka, 1970). The 16 PF scales are considered as first order factors in view of the way that the inventory was constructed. It should be noted, however, that a recent factor analysis of the 16 PF items did not find factors corresponding to the scales (Howarth & Browne, 1971). Confirmation of these results would raise serious questions about the nature of the scales. For the present time, though, it seems prudent to continue viewing the scales as factors, while recognizing that the correspondence may be equivocal.

With one important exception (Hundleby & Connor, 1968), the pertinent studies of the 16 PF bear on the relationship of response styles with either the inventory's first or second order factors, not both. Most of this work centered around the first order factors. Investigations of them (Cattell & Bolton, 1969; Karson & Pool, 1957; LaForge, 1962; Lebovits & Ostfeld, 1970; Mitchell, 1963) found that scales tapping SD [MMPI (Hathaway & McKinley, 1951) F and K, and CPI (Gough, 1957) Cm] and defensiveness (MMPI L and CPI Wb and Gi)--a distinct but associated response style (see the review by Wiggins, 1968)--correlated consistently and often substantially with six scales [C (Ego Strength), H (Parmia), L (Protention), O (Guilt Proneness), Q_3 (Self-Sentiment), and Q_4 (Ergic Tension)]. The SD measures had the highest relationships with these scales, all of which define the second order anxiety factor on this inventory (Cattell, et al., 1970). An additional investigation (Couch & Keniston, 1960) observed that the OAS acquiescence measure correlated appreciably with six scales--Affectothymia and five of these previously listed [all except H (Parmia)].

A study limited to second order factors found that a short form of the OAS measure substantially loaded the anxiety factor only, and other acquiescence indexes defined a separate factor (Hundleby, 1966).

The most comprehensive investigation in this area dealt with the relationship of MMPI F, K, and L scales with both first and second order factors (Hundleby & Connor, 1968). The results at the first order level were roughly similar to those for the previously reviewed studies, the SD and defensiveness measures being correlated, though often moderately, with the six scales associated with the second order anxiety factor. At the second order level, the two kinds of response style measures appreciably loaded only the anxiety factor. The measures did not define this factor, though; the salient loadings for the 16 PF scales were considerably higher.

These studies indicate that the response styles were associated, at least to some extent, with 16 PF first and second order factors, particularly those tapping anxiety. The findings are necessarily limited, though, because standard measures of the various response biases were rarely used and the combined influence of the major response styles of acquiescence and SD at both the first and second order levels was not examined. As a result, the distinct role of each response bias at the various factor levels cannot be precisely delineated. The purpose of the present study was to explore the relationship of the main response styles with first, second, and any higher order factors on the 16 PF, using standard measures of the response biases.

Method

Subjects

The subjects, paid volunteers, were 80 adolescent girls who were either in the eleventh or twelfth grade of high school or had just graduated. All attended the same school in a Northeastern suburb. The results were analyzed for the 69 subjects for whom complete data were available.

Procedure

A large test battery that included the measures for this study was administered during two data gathering sessions, two weeks apart. One group of subjects was given the 16 PF on the first day and another inventory containing the response style measures on the second, and the other group was administered both kinds of questionnaires on the latter day.

16 PF

Forms A (1962 edition) and B (1961 edition) of the 16 PF were used. Scores were obtained for all scales, except B (Intelligence), the corresponding raw scores on the two forms being combined for greater reliability. In addition, scores for the four most stable second order factors--exvia (extroversion), anxiety, cortertia, and independence--were secured with the formulas in the manual for the 1961 and 1962 editions of the 16 PF (Cattell & Eber, undated).

Response Style and Other Measures

The personality inventory assembled for this study included a variety of response style measures. The SD scales were:

(a) Messick's (1962) Ds scale--combines Ds 1 and Ds 2 scales.

(b) Stricker's (1963) SD scale.

The defensiveness scales were:

(a) Wiggins' (1959) Sd scale--revised by reversing 11 randomly selected "true" keyed items so that the scale was balanced in keying.

(b) Marlowe-Crowne (Crowne & Marlowe, 1960) SD scale.

The acquiescence measures were:

(a) Wiggins' (1962) Rb scale.

(b) Messick's (1962) Ac scale--combines Ac 1 and Ac 2 scales.

(c) Clayton and Jackson's (1961) Tentatively Worded F scale items (PF)--six authoritarian and six nonauthoritarian items were used, none overlapping with those on the AF scale; the score was the number of "true" responses.

(d) Clayton and Jackson's (1961) Extremely Worded F scale items (AF)--this scale paralleled the PF scale in design: it consisted of six authoritarian and six nonauthoritarian items, none corresponding to those on the PF scale, and the score was the number of "true" responses.

(e) Total True score--the number of "true" responses on the four SD and defensiveness scales.

In addition, whether the 16 PF and the other inventory were completed at the same testing session or different ones was included as a control variable, Same-Different Day (same day = 0, different day = 1).

Statistical Analysis

Product-moment correlations were computed between the 16 PF scales, second order factor scores, response style measures, and Same-Different Day. A second order factor analysis was carried out by the principal axis method on the 15 x 15 correlation matrix for the 16 PF scales. The number of factors was determined by discontinuities in the distribution of roots in another preliminary analysis employing as the diagonal value for each variable its squared

multiple correlation with the other variables. The factor analysis was completed with iterated communalities. Factors were rotated to oblique simple structure, using a preliminary solution by the Promax procedure (Hendrickson, 1964), followed by hand adjustments. Loadings of the second order factor scores, response style measures, and Same-Different Day on these factors were estimated by extension methods (Dwyer, 1937).

A third order factor analysis was conducted with the 4 x 4 correlation matrix for the four rotated factors obtained at the second order level. This analysis followed the same procedures as the first factor analysis, except that the single third order factor obtained was not rotated. The loadings of the 16 PF scales, second order factor scores, response style measures, and Same-Different Day on the third order factor were estimated by the following matrix equation: $H_{12} = A_1 A_2$, where H_{12} is the loading of a variable on the third order factor, A_1 is the vector of loadings of the variable on the reference vectors for the rotated second order factors, and A_2 is the vector of loadings of the rotated second order factors on the third order factor.

Correspondence was assessed by the Coefficient of Congruence between the loadings of the second order factors in this study and those in the investigation from which the factor score formulas were derived (Gorsuch & Cattell, 1967). These comparisons were based on the 15 scales of the 16 PF--all except B (Intelligence)--included in both analyses. Since loadings of .20 or less were not reported in the earlier study, they were treated as 0 in computing the coefficients. Similarity between the loadings of the third order factor in the present investigation and those in the only reported third order analysis (Cattell, et al., 1970) was visually evaluated. The use of Coefficients of Congruence was precluded because only three variables--the second

order factors of exvia, anxiety, and independence--were common to the two studies.

The internal-consistency reliability of the 16 PF scales and response style measures was estimated by Coefficient Alpha, the 16 PF estimates being based on the product-moment correlation between the Forms A and B scores, and the response style estimates being derived from item statistics.

Results[2]

Reliability and Intercorrelations of 16 PF Scales, Second Order Factor Scores, Response Style Measures, and Same-Different Day

The intercorrelations of the 16 PF scales, second order factor scores, response style measures, and Same-Different Day appear in Table 1 together with the reliability estimates for the 16 PF scales and response style measures. In general, the 16 PF scales and response style measures were moderately reliable, but several were very unreliable. The unreliable 16 PF scales were I (Premsia), .39; N (Shrewdness), .38; and Q_1 (Radicalism), .28; and the unstable response style scales were Messick's Ds, .42; Wiggins' Rb, .27; Messick's Ac, .12; and Clayton and Jackson's PF, .41.

The SD and defensiveness measures had similar patterns of significant ($p < .05$, two tail) and often substantial correlations with the 16 PF scales. The SD measures correlated consistently with four scales--positively with C (Ego Strength) and G (Superego Strength) and negatively with L (Protention) and O (Guilt Proneness). Messick's Ds scale correlated .45 and .49, respectively, with the first two of these scales and -.43 and -.25 with the last two; the corresponding correlations for Stricker's SD scale were .41, .38, -.64, and -.32. The defensiveness measures also correlated consistently with four

scales--positively with C (Ego Strength) and Q_3 (Self-Sentiment) and negatively with O (Guilt Proneness) and Q_4 (Ergic Tension). Wiggins' Sd scale correlated .23 and .36 with the first two and -.29 and -.36 with the other two; the correlations for the Marlowe-Crowne SD scale were .39, .46, -.39, and -.45. All these 16 PF scales, except G (Superego Strength), are associated with the second order anxiety factor (Cattell, et al., 1970).

The acquiescence measures also correlated significantly with the 16 PF scales, most consistently, though moderately, with Q_1 (Radicalism) and Q_3 (Self-Sentiment). The acquiescence indexes that correlated with the first scale were Wiggins' Rb scale, -.34; Clayton and Jackson's AF scale, -.29; and Total True score, -.25; and those that correlated with the second one were Messick's Ac scale, .23; Clayton and Jackson's AF scale, .27; and Total True score, .35. These 16 PF scales do not define the same second order factor (Cattell, et al., 1970).

Same-Different Day correlated significantly with one scale--C (Ego Strength), -.28.

Insert Table 1 about here

Second Order Factor Analysis

The four unrotated factors identified in the second order factor analysis accounted for 21%, 15%, 14%, and 5%, respectively, of the total variance. The correlations between the rotated factors appear in Table 2--Factor I was reflected for ease of interpretation. The correlations were moderate, ranging from -.29 to .31.

Insert Table 2 about here

The rotated factor loadings (i.e., correlations with reference vectors) and communalities are reported in Table 3. The estimated loadings and communalities for the second order factor scores, response style measures, and Same-Different Day also appear in this table. The Coefficients of Congruence between these factors and those in the earlier investigation (Gorsuch & Cattell, 1967) are reported in Table 4.

Factors I, II, and III were closely related to the previously identified second order factors, both in terms of the Coefficients of Congruence between the sets of loadings as well as the loadings of the second order factor scores on the present factors. Factor I's highest Coefficient of Congruence was with the anxiety factor (.82), Factor II's was with the exvia factor (.64), and Factor III's was with the independence factor (.89). Factor IV's highest coefficient was also with the anxiety factor (.77). The remaining coefficients between the present factors and the eight factors in the previous analysis were considerably lower ($<|.50|$). These relationships were paralleled by the loadings on the factor scores: Factor I's highest loading was on the anxiety score (.81), Factor II's was on the exvia score (.85), Factor III's was on the independence score (.94), and Factor IV's was on the anxiety score (.56). In addition, Factor II had a substantial loading on the independence score (.65), and Factors I, II, and III had marginal loadings on the cortertia score (-.39, .37, and -.33, respectively).

The SD scales had scattered loadings ($\geq|.30|$) on Factors II and III--Messick's Ds scale loaded these factors -.36 and -.34, respectively--and consistent and substantial loadings on Factor IV. These loadings on Factor IV-- -.79 for Stricker's SD scale and -.50 for Messick's Ds scale--equaled or

exceeded the loadings of the 16 PF scales on this factor-- -.79 for L (Protention), -.45 for C (Ego Strength), .43 for Q_4 (Ergic Tension), -.42 for G (Superego Strength), and .42 for O (Guilt Proneness).

The defensiveness scales had scattered loadings on Factors II (Marlowe-Crowne SD scale, -.46), III (Wiggins' Sd scale, -.36), and IV (Marlowe-Crowne SD scale, -.47), and consistent but borderline loadings on Factor I-- -.35 for the Marlowe-Crowne Sd scale and -.32 for Wiggins' Sd scale. These loadings on Factor I were considerably lower than most of those for the 16 PF scales--.73 for O (Guilt Proneness), .70 for Q_4 (Ergic Tension), -.67 for Q_3 (Self-Sentiment), -.48 for H (Parmia), -.45 for C (Ego Strength), -.41 for N (Shrewdness), -.34 for Q_1 (Radicalism), and -.30 for E (Dominance).

The acquiescence measures had scattered and marginal loadings on Factors I (Clayton & Jackson's PF scale, -.30), II (Clayton & Jackson's AF scale, -.43), and IV (Messick's Ac scale, .30; Clayton & Jackson's PF scale, .30; and Total True score, -.34), but generally loaded appreciably on Factor III. The loadings on the latter factor were -.48 for the Total True score, -.45 for Clayton and Jackson's AF scale, and -.35 for Wiggins' Rb scale. These loadings, however, were substantially lower than most of the 16 PF scales' loadings--.81 for M (Autia), .64 for Q_2 (Self-Sufficiency), -.52 for A (Affectothymia), .51 for Q_1 (Radicalism), .38 for E (Dominance), .38 for I (Premsia), and -.32 on F (Surgency).

Same-Different Day did not load any factor.

Insert Tables 3 and 4 about here

Third Order Factor Analysis

The unrotated factor identified in the third order factor analysis represented 22% of the total variance. The loadings and communalities of the second order factors in this analysis are contained in Table 5. This factor was loaded by three of the second order factors--.58 for Factor III, .55 for Factor IV, and -.49 for Factor II. It does not appear similar to any of the third order factors in the earlier investigation (Cattell, et al., 1970).

The estimated loadings and communalities of the 16 PF scales, second order factor scores, response style measures, and Same-Different Day on this factor appear in Table 3. The response style measures had only a few marginal loadings on this factor-- -.30 for Messick's Ds scale, -.32 for Wiggins' Rb scale, and -.35 for Total True score--and Same-Different Day did not load it.

Insert Table 5 about here

Discussion

Despite the relatively small sample size, the results of this study were reasonably clear and generally agree with previous findings. The minimal relationships of Same-Different Day with the 16 PF scales and higher order factors indicate that pooling subjects from the two sessions did not distort the results because of mean differences between the groups.

First Order Factors

It is striking that measures of each response style were appreciably associated with the first order factor scales on the 16 PF. The links of the SD and defensiveness measures with 16 PF scales defining the second order anxiety factor are in line with the bulk of previous research. Contrary to

an earlier study (Couch & Keniston, 1960), though, the acquiescence indexes were not generally related to these same 16 PF scales, perhaps because the OAS acquiescence measure used in that investigation also taps other kinds of stylistic and content variance (e.g., Block, 1965). The findings about the SD scales are consistent with Vernon's (1964) contention that the variance for this response style is diffused among the 16 PF scales. The cause of this pervasiveness of SD and the other response styles on scales presumably reflecting separate content factors is still uncertain. Vernon's (1964) suggestion that this situation is an inherent characteristic of the factor analytic method is supported by the finding that method and content variance interact, making it difficult to isolate response style factors from content factors (Campbell & O'Connell, 1967). On the other hand, Borgatta's (1968) implication that response styles may intrude when measures of content factors are constructed is consistent with the disparity between 16 PF scales and factors observed in the recent factor analysis of the inventory's items (Howarth & Browne, 1971). Such a discrepancy would presumably indicate that the test construction process was unsuccessful, whether because of the operation of response biases or some other reason, in deriving scales which accurately reflect the factors involved.

Second Order Factors

The narrow relationships between the response style measures and the second order factors--each style predominantly being connected with a single factor--contrasted sharply with the relatively wide associations of the various kinds of response bias scales with the first order factors. This outcome

indicates that the variance for each style combined at the second order level, implying that the response styles are a higher order phenomenon rather than a first order effect. This suggestion is broadly congruent with the views of Block (1965), Borgatta (1968), and Vernon (1964) about the factor level at which response biases appear. Although ties existed between the response style measures and the second order factors, they do not support Vernon's (1964) linking of SD response style with the anxiety factor and acquiescence with the extroversion factor.

The SD scales were unique among the response bias measures in actually defining a second order factor; the factor involved was not anxiety, however, but a novel one somewhat resembling that factor. One conjecture is that the usual anxiety factor split into two factors in this study, for some unknown reason, one tapping anxiety and the other reflecting SD response style. The general lack of association between the SD scales and the anxiety factor is consistent with a previous finding that such measures were related to this factor but did not define it (Hundleby & Connor, 1968). The emergence of an SD response style factor is not surprising in view of the heavy involvement of this response bias at the first order level and the ubiquitous presence of such a factor in other personality inventories (e.g., Jackson & Messick, 1962; Messick, 1962). It is noteworthy, though, that this factor was considerably less influential on the 16 PF than on the MMPI and other instruments which, in common with the 16 PF, take no special precautions to minimize the influence of this response style. Although the SD factor was the smallest one on the 16 PF and only accounted for 5% of the total variance in this study, this factor was the largest one on the MMPI and explained 38% of the variance in one investigation (Edwards, Diers, & Walker, 1962). It is unclear whether this

difference between the 16 PF and other questionnaires is due to the way that they are constructed or to the nature of their content--the MMPI, in particular, predominantly consists of extremely desirable and undesirable pathological items, and such questions are especially susceptible to SD response style (e.g., Jackson & Messick, 1962).

The acquiescence measures, rather than being associated with the extroversion factor, were generally related to a second order independence factor defined by the 16 PF scales, not the response style indexes. This failure of the acquiescence measures to align with the extroversion factor agrees with an earlier finding that acquiescence indexes generated a distinct factor or were linked with the anxiety factor (Hundleby, 1966). The weak but consistent relationship between the acquiescence measures and the independence factor in the present study may indicate that the 16 PF scales on this factor are contaminated by acquiescence, despite the balanced keying of the scales which should minimize the effects of this response style. Alternatively, the connection may be substantive in nature, in line with previous conceptualizations of acquiescence as a reflection of conformity (e.g., Bass, 1956). Balanced keying may account, at least in part, for the minor involvement of acquiescence on the 16 PF in contrast with its greater influence on other inventories, such as the MMPI, that do not control keying in this way. MMPI studies have consistently found acquiescence to be the largest or second largest factor (e.g., Edwards & Diers, 1962; Messick & Jackson, 1961).

It should be noted that recent research (Bentler, Jackson, & Messick, 1971) suggests that it is valuable to distinguish between two kinds of acquiescence: agreement acquiescence and acceptance acquiescence. Current measures, including those in this study, confound the two, and it is

problematical whether the same results would be obtained if separate indexes of each were used.

It is especially interesting that the measures of each response style were essentially unrelated to the two main second order factors of anxiety and extroversion. The defensiveness indexes were marginally associated with the anxiety factor but this factor clearly reflected the content of the salient 16 PF scales. The minimal role of defensiveness on the 16 PF contrasts with its distinct involvement on other inventories. On the MMPI, for example, this response style emerges as a separate though small factor (Edwards, et al., 1962). The relative unimportance of defensiveness on the 16 PF may be a reflection that this inventory contains few of the unusual items--those with discrepant desirability and communality--that are prone to this response bias (Jackson & Messick, 1962). Finally, none of the various kinds of response style indexes were consistently related to the extroversion factor

Third Order Factor

The overall lack of association between the response style measures and the third order factor implies that this factor taps content, though its precise nature is unclear and it does not resemble any third order factor previously identified on the 16 PF (Cattell, et al., 1970). The independence of this factor from the SD scales is contrary to Borgatta's (1968) suggestion that such a third order factor may be related to this response bias.

Overview

It is apparent from this study that all the response biases were involved with the 16 PF at the first order level, only SD response style had an important presence at the second order, and none were implicated at the third.

A related outcome was that acquiescence and SD response styles were not linked with the major second order factors of extroversion and anxiety or a third order factor. On the other hand, the present findings had some puzzling aspects. Although three of the four best established second order factors on the 16 PF were found in this investigation, the fourth factor was an enigma, particularly intriguing in view of its close association with SD response style. The precise meaning of the third order factor in this study was also uncertain. Further work along this line might profitably explore the generality of these findings to the Eysenck Personality Inventory (Eysenck & Eysenck, 1963) and other factor analytically based questionnaires, use item factor analyses rather than existing factor scales, include measures of agreement acquiescence and acceptance acquiescence, and employ large samples of both sexes from student, adult, and patient groups.

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Footnotes

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[2]Tables containing the unrotated factor matrix and transformation matrix for the second order factor analysis are available from the author.

Table 1

Intercorrelations of 16 PF Scales, Second Order Factor Scores, Response Style Measures, and Same-Different Day

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
16 PF Scales:																													
1. A (Affectothymia)	(64)	13	-14	29	-06	17	-25	-13	-39	16	-17	-27	-44	-01	-13	29	-16	-05	-52	26	17	24	21	09	-07	19	06	37	17
2. C (Ego Strength)	13	(73)	07	15	21	40	-19	-38	-09	19	-63	00	-19	34	-56	28	-73	43	-11	45	41	23	39	16	07	-10	02	49	-24
3. E (Dominance)	-14	07	(82)	41	-47	55	-07	16	45	01	-24	33	05	-20	-15	71	-17	37	71	-19	-17	-05	-28	15	08	-38	16	-19	-04
4. F (Surgency)	29	15	41	(73)	-39	45	-25	00	-06	-19	-16	-10	-49	-35	-03	80	-10	45	01	02	-12	11	-28	41	-11	-17	13	10	-16
5. G (Superego Strength)	-06	21	-47	-39	(59)	-14	15	-37	-34	07	-18	00	-03	29	-22	-37	-24	-14	-40	49	38	20	48	-13	-02	25	01	41	09
6. H (Parmia)	17	40	55	45	-14	(86)	-10	03	04	16	-53	08	-28	10	-41	83	-56	39	17	05	-02	33	15	16	08	-15	09	24	-15
7. I (Premsia)	-25	-19	-07	-25	15	-10	(39)	-04	34	05	20	07	28	-08	08	-22	16	-78	19	-08	09	-14	07	-16	-05	-15	-19	-14	15
8. L (Protention)	-13	-38	16	00	-37	03	-04	(52)	04	-03	33	-05	18	-06	33	03	46	01	15	-43	-64	-09	-41	-09	27	08	27	-29	03
9. M (Autia)	-39	-09	45	-06	-34	04	34	04	(52)	08	07	40	44	-21	-05	04	05	-24	80	-32	04	-24	-12	-20	02	-43	-19	-35	-04
10. N (Shrewdness)	16	19	01	-19	07	16	05	-03	08	(38)	-29	21	05	34	-30	-01	-31	09	04	14	09	13	32	-27	05	-05	08	19	-05
11. O (Guilt Proneness)	-17	-63	-24	-16	-18	-53	20	33	07	-29	(70)	-24	08	-45	74	-39	90	-40	-06	-25	-32	-29	-39	09	14	01	-16	-37	13
12. Q_1 (Radicalism)	-27	00	33	-10	00	08	07	-05	40	21	-24	(28)	33	16	-22	00	-21	03	64	-20	06	-19	-05	-34	00	-29	-12	-25	06
13. Q_2 (Self-Sufficiency)	-44	-19	05	-49	-03	-28	28	18	44	05	08	33	(55)	02	04	-46	14	-30	58	-43	-21	-37	-06	-42	04	-11	01	-53	02
14. Q_3 (Self-Sentiment)	-01	34	-20	-35	29	10	-08	-06	-21	34	-45	16	02	(69)	-53	-18	-59	09	-16	24	10	36	46	-19	23	27	18	35	04
15. Q_4 (Ergic Tension)	-13	-56	-15	-03	-22	-41	08	33	-05	-30	74	-22	04	-53	(72)	-25	89	-22	-07	-21	-32	-36	-45	08	-07	00	-20	-36	09
Second Order Factor Scores:																													
16. Exvia	29	28	71	80	-37	83	-22	03	04	-01	-39	00	-46	-18	-25	(--)	-37	50	19	06	-07	25	-11	34	00	-21	16	19	-16
17. Anxiety	-16	-73	-17	-10	-24	-56	16	46	05	-31	90	-21	14	-59	89	-37	(--)	-36	-01	-34	-40	-40	-51	02	02	02	-11	-46	18
18. Cortertia	-05	43	37	45	-14	39	-78	01	-24	09	-40	03	-30	09	-22	50	-36	(--)	04	13	-10	20	-10	28	07	-04	23	20	-19
19. Independence	-52	-11	71	01	-40	17	19	15	80	04	-06	64	58	-16	-07	19	-01	04	(--)	-43	-16	-28	-27	-20	04	-46	-03	-49	-03
Response Style Measures:																													
20. Messick's Ds	26	45	-19	02	49	05	-08	-43	-32	14	-25	-20	-43	24	-21	06	-34	13	-43	(42)	48	33	44	12	-01	07	-02	66	-09
21. Stricker's SD	17	41	-17	-12	38	-02	09	-64	04	09	-32	06	-21	10	-32	-07	-40	-10	-16	48	(72)	13	34	-08	-27	-18	-44	37	04
22. Wiggins' Sd	24	23	-05	11	20	33	-14	-09	-24	13	-29	-19	-37	36	-36	25	-40	20	-28	33	13	(52)	32	19	01	18	13	65	03
23. Marlowe-Crowne SD	21	39	-28	-28	48	15	07	-41	-12	32	-39	-05	-06	46	-45	-11	-51	-10	27	44	34	32	(78)	-22	02	30	07	65	-18
24. Wiggins' Rb	09	16	15	41	-13	16	-16	-09	-20	-27	09	-34	-42	-19	08	34	02	28	-20	12	08	19	-22	(27)	13	04	18	21	05
25. Messick's Ac	-07	07	08	-11	-02	08	-05	27	02	05	14	00	04	23	-07	00	02	07	04	-01	-27	01	02	13	(12)	26	23	00	04
26. Clayton and Jackson's AF	19	-10	-38	-17	25	-15	-15	08	-43	-05	01	-29	-11	27	00	-21	02	-04	-46	07	-18	18	30	04	26	(56)	55	35	19
27. Clayton and Jackson's PF	06	02	16	13	01	09	-19	27	-19	08	-16	-12	01	18	-20	16	-11	23	-03	-02	-44	13	07	18	23	55	(41)	18	11
28. Total True	37	49	-19	10	41	24	-14	-29	-35	19	-37	-25	-53	35	-36	19	-46	20	-49	66	37	65	65	21	00	35	18	(73)	-07
29. Same-Different Day	17	-24	-04	-16	09	-15	15	03	-04	-05	13	06	02	04	09	-16	18	-19	-03	-09	04	03	-18	05	04	19	11	-07	(--)

Note.--Decimal points have been omitted. Internal-consistency reliability coefficients appear in parentheses. Correlations of .23 and .30 are significant at the .05 and .01 levels (two tail), respectively.

Table 2

Intercorrelations of Obliquely Rotated 16 PF Second Order Factors

Factor	II	III	IV
I[a]	.04	.14	.05
II		-.29	-.28
III			.31

[a]Factor I has been reflected.

Table 3

Loadings of 16 PF Scales, Second Order Factor Scores, Response Style Measures, and Same-Different Day on 16 PF Second and Third Order Factors

Variable	Second Order Factor[a] I	II	III	IV	h^2	Third Order Factor[b] I	h^2
16 PF Scales:							
A (Affectothymia)	-.01	-.01	-.*52*	-.02	.33	-.*31*	.10
C (Ego Strength)	-.*45*	-.02	-.09	-.*45*	.52	-.*34*	.11
E (Dominance)	-.*30*	.*83*	.*38*	.10	.77	-.17	.03
F (Surgency)	.10	.*65*	-.*32*	-.01	.76	-.*50*	.25
G (Superego Strength)	-.06	-.*63*	-.07	-.*42*	.49	.03	.00
H (Parmia)	-.*48*	.*51*	-.06	-.07	.58	-.*37*	.14
I (Premsia)	.13	-.10	.*38*	-.12	.21	.22	.05
L (Protention)	-.05	.26	-.05	.*79*	.64	.27	.07
M (Autia)	-.07	.*45*	.*81*	-.09	.73	.19	.04
N (Shrewdness)	-.*41*	-.08	.09	-.05	.19	.02	.00
O (Guilt Proneness)	.*73*	-.09	-.02	.*42*	.81	.*34*	.12
Q_1 (Radicalism)	-.*34*	.17	.*51*	-.10	.*34*	.12	.02
Q_2 (Self-Sufficiency)	-.11	-.07	.*64*	.09	.56	.*44*	.19
Q_3 (Self-Sentiment)	-.*67*	-.*40*	-.06	-.04	.67	.07	.00
Q_4 (Ergic Tension)	.*70*	.02	-.10	.*43*	.70	.24	.06
Second Order Factor Scores[c]:							
Exvia	-.26	.*85*	-.20	.00	1.06	-.*56*	.31
Anxiety	.*81*	.00	-.03	.*56*	1.07	.*37*	.14
Cortertia	-.*39*	.*37*	-.*33*	.11	.52	-.*36*	.13
Independence	-.26	.*65*	.*94*	.03	1.12	.22	.05
Response Style Measures:							
Messick's Ds	-.04	-.*36*	-.*34*	-.*50*	.51	-.*30*	.09
Stricker's SD	.02	-.29	.09	-.*79*	.64	-.24	.06
Wiggins' Sd	-.*32*	-.10	-.*36*	-.07	.31	-.23	.05
Marlowe-Crowne SD	-.*35*	-.*46*	-.06	-.*47*	.52	-.10	.01
Wiggins' Rb	.26	.23	-.*35*	-.07	.33	-.*32*	.10
Messick's Ac	-.23	.01	-.02	.*30*	.15	.12	.01
Clayton and Jackson's AF	-.02	-.*43*	-.*45*	.20	.37	.05	.00
Clayton and Jackson's PF	-.*30*	.07	-.20	.*30*	.21	-.02	.00
Total True	-.24	-.28	-.*48*	-.*34*	.57	-.*35*	.12
Same-Different Day	.07	-.15	-.03	.20	.09	.17	.03

Note.--The loadings for the second order factor scores, response style measures, and Same-Different Day on the second order factors and the loadings for all variables on the third order factor have been estimated. Loadings of .30 or greater have been italicized.

[a]The second order factor loadings are for obliquely rotated factors; these loadings are actually correlations with reference vectors. Second order Factor I has been reflected.

[b]The third order factor loadings are for an unrotated factor.

[c]Communalities for second order factor scores exceed unity as a consequence of the linear dependence of these scores on the 16 PF scales.

Table 4

Coefficients of Congruence Between Second Order Factors in This Study and the Gorsuch and Cattell Investigation

Gorsuch and Cattell Factor	This Study's Factor			
	I	II	III	IV
I (Anxiety)	.82	.05	-.01	.77
II (Exvia)	-.20	.64	-.32	-.03
III (Cortertia)	-.14	.04	.04	.07
IV (Independence)	-.26	.41	.89	.00
V (Cultured Tact)	-.49	-.11	.17	-.08
VI (Untamedness)	-.09	.28	.31	.00
VII (Intelligence)	.00	.00	.00	.00
VIII (Superego Strength)	-.04	-.42	-.05	-.35

Table 5

Loadings of 16 PF Second Order Factors
on Third Order Factor

Variable	Third Order Factor I	h^2
Factor I	.10	.01
Factor II	-.*49*	.24
Factor III	.*58*	.34
Factor IV	.*55*	.30

Note.--Loadings of .30 or greater have been italicized.

APPENDIX

Table A

Unrotated Loadings of 16 PF Scales, Second Order Factor Scores, Response Style Measures, and Same-Different Day on 16 PF Second Order Factors

Variable	Factor I	II	III	IV
16 PF Scales:				
A (Affectothymia)	-.28	-.01	.50	.06
C (Ego Strength)	-.71	-.07	.00	-.13
E (Dominance)	-.20	.81	-.28	.03
F (Surgency)	-.24	.66	.49	-.14
G (Superego Strength)	-.20	-.64	-.04	-.19
H (Parmia)	-.59	.47	.03	.10
I (Premsia)	.23	-.10	-.33	-.20
L (Protention)	.39	.28	-.02	.64
M (Autia)	.17	.43	-.68	-.24
N (Shrewdness)	-.31	-.11	-.23	.17
O (Guilt Proneness)	.88	-.02	.17	-.01
Q_1 (Radicalism)	-.13	.14	-.55	-.01
Q_2 (Self-Sufficiency)	.30	-.08	-.68	.06
Q_3 (Self-Sentiment)	-.50	-.45	-.24	.40
Q_4 (Ergic Tension)	.79	.08	.26	.00
Second Order Factor Scores[a]:				
Exvia	-.53	.83	.31	.00
Anxiety	1.01	.08	.21	.05
Cortertia	-.50	.35	.26	.27
Independence	.11	.63	-.84	-.09
Response Style Measures:				
Messick's Ds	-.44	-.38	.31	-.28
Stricker's SD	-.39	-.32	-.03	-.62
Wiggins' Sd	-.46	-.12	.23	.18
Marlowe-Crowne SD	-.50	-.50	-.10	-.11
Wiggins' Rb	-.06	.24	.48	-.19
Messick's Ac	.00	.00	-.10	.37
Clayton and Jackson's AF	.00	-.42	.30	.32
Clayton and Jackson's PF	-.16	.06	.07	.42
Total True	-.58	-.30	.37	-.04
Same-Different Day	.22	-.14	-.01	.16

Note.--The loadings for the second order factor scores, response style measures, and Same-Different Day have been estimated.

[a]A loading for a second order factor score exceeds unity as a consequence of the linear dependence of these scores on the 16 PF scales.

Table B

Transformation Matrix for Obliquely Rotated 16 PF Second Order Factors

Factor	I	II	III	IV
I	-.7365	-.0669	.1577	.4703
II	.0168	.9968	.1996	.2527
III	-.4504	-.0431	-.9190	.1225
IV	.5044	.0020	-.3012	.8366

Note.--This transformation matrix, when applied directly to the unrotated factor matrix, yields the obliquely rotated factor solution.